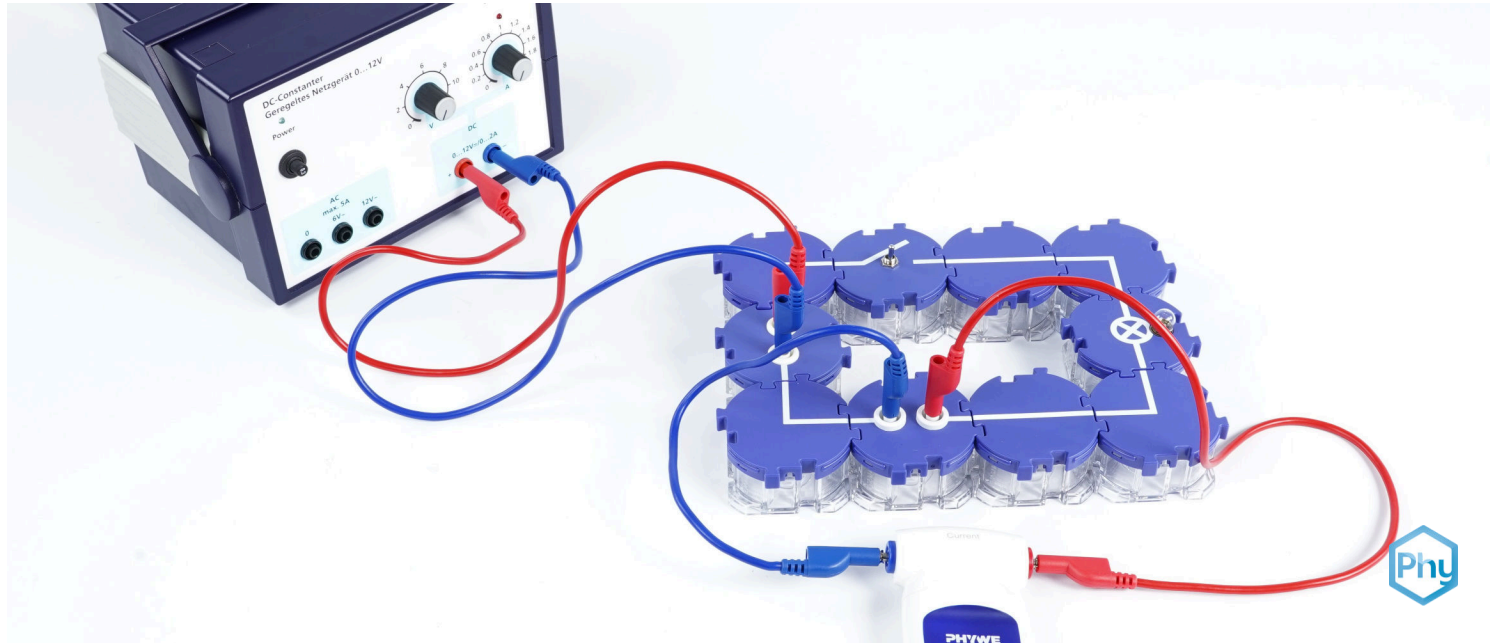


Measurement of current with Cobra SMARTsense



Physics

Electricity & Magnetism

Simple circuits, resistors & capacitors



Difficulty level

easy



Group size

-



Preparation time

10 minutes



Execution time

10 minutes

This content can also be found online at:



<https://www.curriculab.de/c/67f78551970a480002628495>

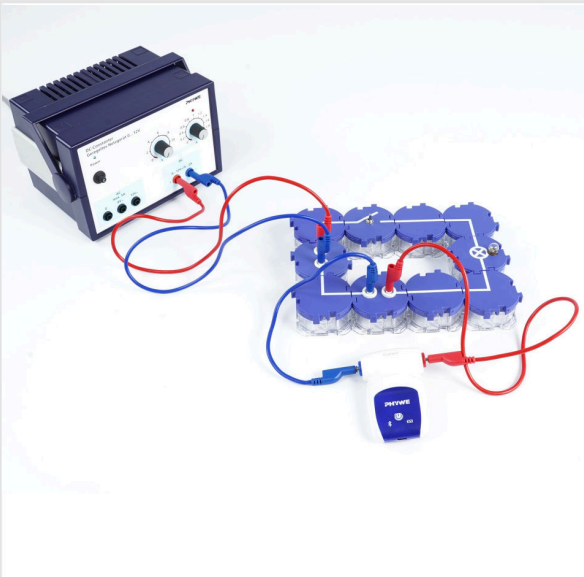
PHYWE

Teacher information



Application

PHYWE



The electric current I is a fundamental quantity in electrical engineering. As the name suggests, the amperage measures the strength of the electric current, i.e. how many charge carriers flow in what time:

$$1 \text{ A} = 1 \text{ C/s}$$

Other teacher information (1/2)

PHYWE

Prior



It is assumed that the pupils are familiar with the concept of electric current and its unit. If they know that the electric current is a measure of the number of freely moving electrons that pass through a conductor cross-section per unit of time, then they will easily recognise that an ammeter must be connected in series in the circuit.

Principle



The current strength is a measure of the number of charges that pass through a cross-sectional area per unit of time.

$$I = \frac{\Delta Q}{\Delta t}$$

Other teacher information (2/2)

PHYWE

Learning



The students should measure the current in a simple circuit and understand why the measuring device must be connected in series.

Tasks



The students build a simple electric circuit with a light bulb and familiarise themselves with measuring electric current.

Safety instructions

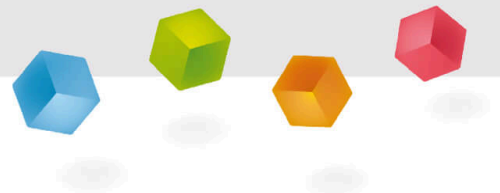
PHYWE



The general instructions for safe experimentation in science lessons apply to this experiment.

PHYWE

Student information



Motivation

PHYWE



Lightning storm over a city at night

Electricity is required for electrical devices, such as a smartphone. The amount of current is measured with the so-called amperage with the unit A (Ampere) is described.

Electrical currents in the form of lightning are particularly impressive. These currents flow at an incredible average of around 20,000 amperes, which is why lightning is very dangerous for humans.

The currents in our everyday lives rarely exceed a few amperes. In this experiment, the electric current is analysed and you will learn how to measure the current.

Tasks

PHYWE



Build a simple circuit with a light bulb and familiarise yourself with how to measure the flowing electrical current.

Equipment

Position	Equipment	Item no.	Quantity
1	Cable module, straight, SB	05601-01	2
2	Cable module, angled, SB	05601-02	4
3	Line module, interrupted with sockets, SB	05601-04	2
4	Off switch, SB	05602-01	1
5	Lamp socket E10, SB	05604-00	1
6	Connecting cable, 32 A, 250 mm, red Experiment cable, 4 mm plug	07360-01	1
7	Connecting cable, 32 A, 250 mm, blue Experimental cable, 4 mm plug	07360-04	1
8	Connecting cable, 32 A, 500 mm, red Experiment cable, 4 mm plug	07361-01	1
9	Connecting cable, 32 A, 500 mm, blue Experimental cable, 4 mm plug	07361-04	1
10	Bulbs 4 V/0.04 A/0.16 W, E10 base Set of 10 bulbs	06154-03	1
11	Bulb 6 V/0.5 A, E 10, 10 pieces	35673-03	1
12	Bulbs 12 V/0.1 A/ 1.2 W, E10 base Set of 10 bulbs	07505-03	1
13	Cobra SMARTsense Current - Sensor for measuring electrical current ± 1 A (Bluetooth + USB)	12902-01	1
14	PHYWE power supply unit, RiSU 2019 DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

Setup (1/3)

PHYWE

For measurement with the **Cobra SMARTsense sensors** the **PHYWE measureAPP** required. The app can be downloaded free of charge from the relevant app store (see below for QR codes). Before starting the app, please check whether your device (smartphone, tablet, desktop PC) has **Bluetooth activated** is.



iOS



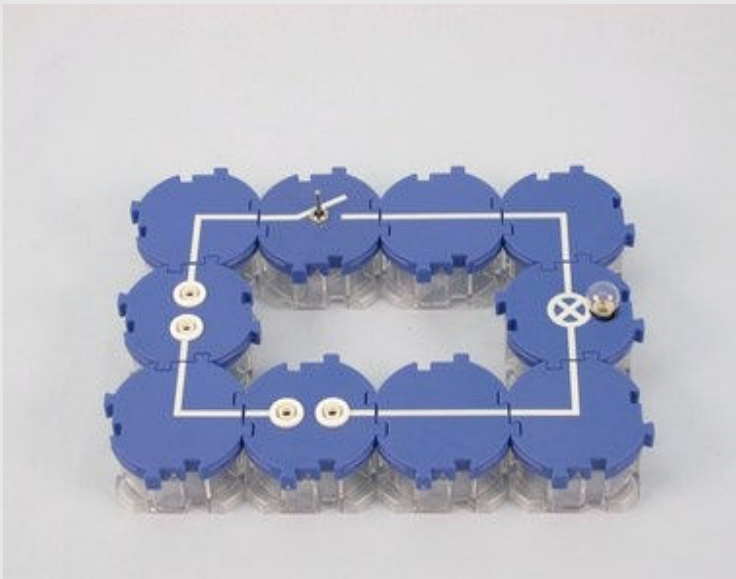
Android



Windows

Setup (2/3)

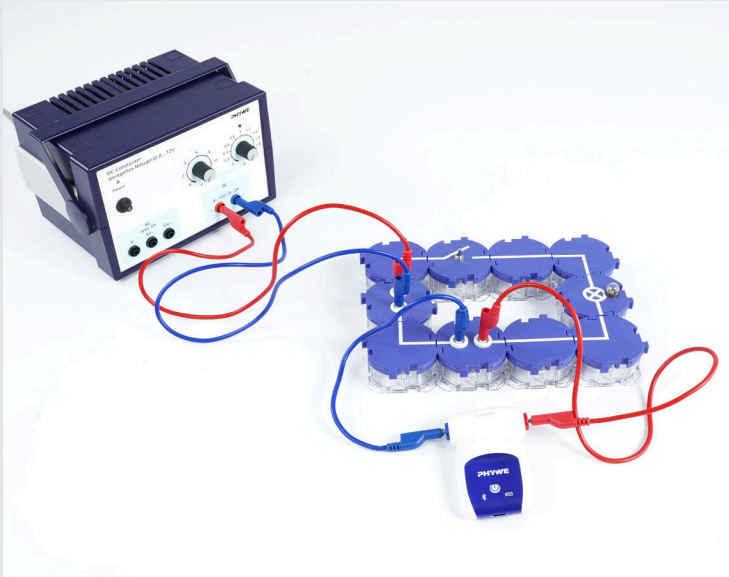
PHYWE



- Build the circuit as shown in the adjacent diagram.

Setup (3/3)

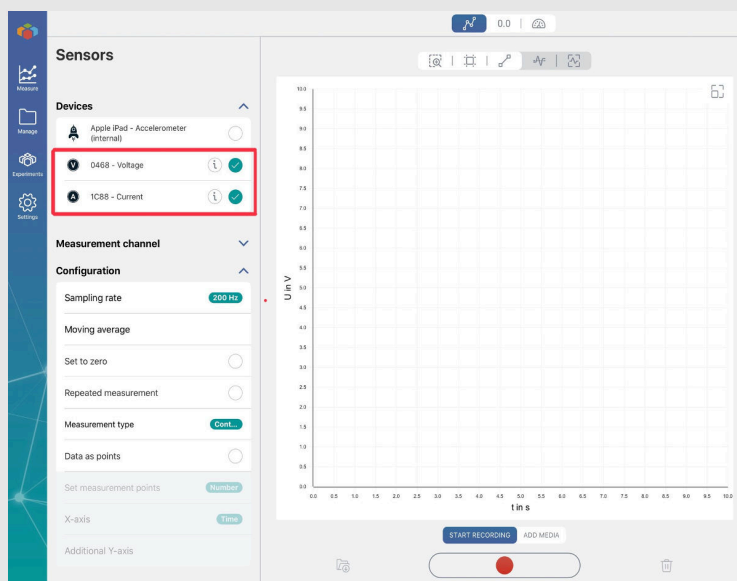
PHYWE



- Connect the power supply unit and the SMARTsense Current Sensor to your circuit as shown in the illustration.
- Screw the bulb for the rated voltage of 4 V into the bulb holder and open the switch.
- Use the current limit on the lamp as a guide for the current to be set on the power supply unit.
- Switch on the power supply unit and adjust the current if necessary.

Procedure (1/3)

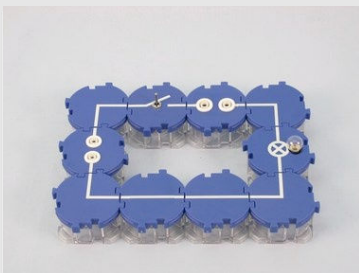
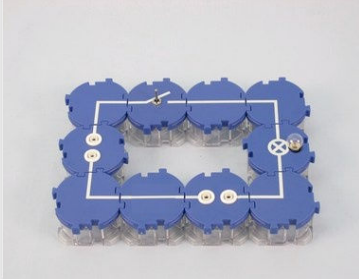
PHYWE



- Switch on the SMARTsense Current Sensor by pressing and holding the power button and make sure that the tablet can connect to Bluetooth devices.
- Open the PHYWE measure app and select the sensors "Current".
- The measurement can be saved after each of the following measurements. The measurement can be opened again at any time under "My measurements" for further analysis.

Realisation (2/3)

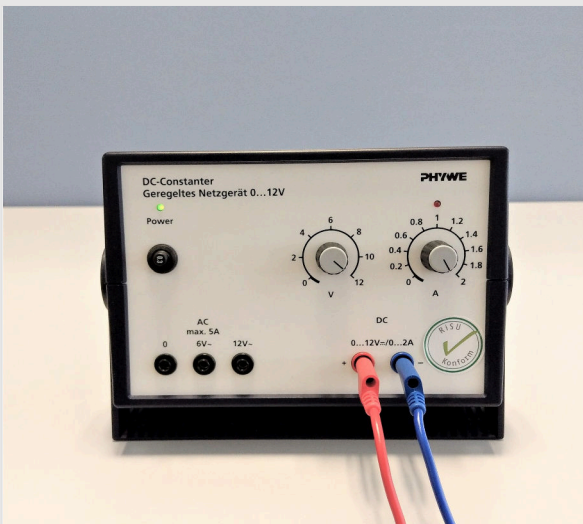
PHYWE



- Use the switch to close the power circuit and slowly increase the voltage on the power supply unit to 4 V.
- Amperage I measure and note the measured value.
- Open the switch.
- Swap the interrupted component with the lines to the measuring device with the straight line components at various points in the circuit in order to measure the current at different positions in the circuit.
- Observe the measured value displayed in each case.

Realisation (3/3)

PHYWE

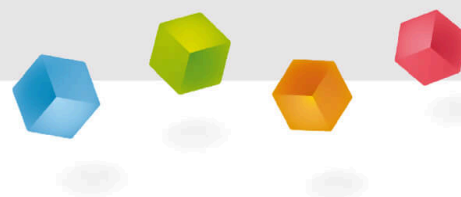


Power supply unit with set 12 V

- Disconnect the circuit and replace the 4 V bulb with the 12 V bulb.
- Close the circuit again.
- Increase the voltage on the power supply unit to 12 V, leave the measured value for the current I and note the value in the log.
- Set the power supply unit to 0 V and switch it off.

PHYWE

Report



Table

PHYWE

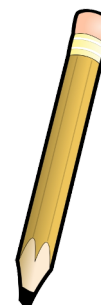
 $U [V]$ Measuring range $I [A]$

4 300 mA

12 3 A

12 300 mA

For each part of the experiment, enter the corresponding measured value for the amperage I in!



Task 1

PHYWE

The same amperage is displayed at every point in the circuit

☐ True☐ False☒ Check

Task 2

PHYWE



How must a measuring device be connected to measure the current?

The measuring device must ...

☐ ... must be connected in parallel to the power source.☐ ... are only in the neighbourhood.☐ ... must be connected in parallel to the electrical load.☐ ... must be connected in series.☒ Check

Task 3

PHYWE



What needs to be taken into account when measuring the current?

- ☐ The ammeter must be connected in series.
- ☐ The appropriate measuring range must be selected.
- ☐ The correct connection sockets on the measuring device must be used.
- ☐ It does not matter which connection sockets are selected for the measuring device.
- ☐ The ammeter must be connected in parallel.

✓ Check

Slide

Score/Total

Slide 18: Amperage at different positions	0/1
Slide 19: Series connection of the ammeter	0/1
Slide 20: What do I need to know about the ammeter?	0/3

Total amount  0/5

👁 Solutions

🔄 Repeat

📄 Export text